



# PINBALL TECHNOLOGY

## NB2

User manual  
Revision D  
November 2021

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## Preamble

«Bally», «Stern» and the names of all the games are the property of, respectively, Bally and Stern. All other company or product names are registered trademarks of their respective companies.

NB2 board board is a replacement board for the Bally and Stern pinball machines, 6 and 7 digits series. It replaces the two following electronic boards: the CPU board and the sound board. It is compatible with the following games :

FREEDOM	SPACE INVADERS
NIGHT RIDER	ROLLING STONES
EVEL KNIEVEL	MYSTIC
EIGHT BALL	HOTDOGGIN
POWER PLAY	VIKING
MATA HARI	SKATEBALL
BLACK JACK	FRONTIER
STRIKES AND SPARES	XENON
LOST WORLD	FLASH GORDON
THE SIX MILLION DOLLAR MAN	EIGHT BALL DELUXE
PLAYBOY	FIREBALL II
SUPERSONIC	EMBRYON
VOLTAN	FATHOM
STAR TREK	MEDUSA
KISS	ELEKTRA
PARAGON	VECTOR
HARLEM GLOBETROTTERS	SPECTRUM
DOLLY PARTON	MR AND MRS PACMAN
FUTURE SPA	XS AND OS
NITRO GROUND SHAKER	SPEAKEASY
SILVERBALL MANIA	KINGS OF STEEL
CENTAUR	HOT HAND
BMX	MAGIC
BLACK PYRAMID	METEOR

SPY HUNTER

GRAND SLAM

GOLD BALL

RAPID FIRE

~~BABY PACMAN~~

FIREBALL CLASSIC

CYBERNAUT

PINBALL

STINGRAY

STARS

MEMORY LANE

LECTRONAMO

WILD FYRE

NUGENT

DRACULA

TRIDENT

GALAXY

ALI

BIG GAME

SEAWITCH

QUICKSILVER

FLIGHT 2000

STAR GAZER

NINE BALL

FREEFALL

LIGHTNING

SPLIT SECOND

CATACOMB

VIPER

DRAGONFIST

IRON MAIDEN

ORBITOR 1

## Package content

- The NB2 board in its anti-static packaging
- The Quick install guide
- A SD/ $\mu$ SD adapter
- A 2pin extension
- The bill

## Warranty certificate

The NB2 board has a two-year limited liability warranty (parts and labor).

This warranty is valid throughout the European Union for defects resulting from normal use of the product.

The warranty period begins at the time of shipment of the product or base on a valid proof of delivery.

When you make a claim under this limited warranty, you will be required to provide :

- the product
- the original proof of purchase, clearly indicating the name and address of the seller, the date, the place of purchase and the type of product

You will be required to properly protect the product against shocks and to include a note describing the damage found. This limited warranty excludes any liability that is not covered here such as shipping charges.

This limited warranty does not cover normal wear, accidental damages and defects caused by rough handling (including defects caused by high pressure, bending, squeezing, falling, etc.), or defects caused by improper use of the product.

This limited warranty does not cover damage caused by a conversion or a repair done by the user or a third party.

This limited warranty is not applicable if the product has been exposed to moisture, extreme thermal conditions or rapid changes in temperature, corrosion, oxidation, spillage of food or liquid or the influence of chemicals.

This limited warranty is not applicable if the product has been damaged due to improper packaging or inadequate protection during transportation.

This limited warranty no longer applies if the product is transferred to a third party during the warranty period.

## Installation

**/!** The pinball machine must be turned off before handling any electronic boards, connectors and fuses. If in doubt, unplug the power cable from the machine.

Required equipment for the installation :

- Phillips PH2 screwdriver
- A voltmeter
- The Bally/Stern Instruction Manual of the current game

Installation time : approximately 20 minutes

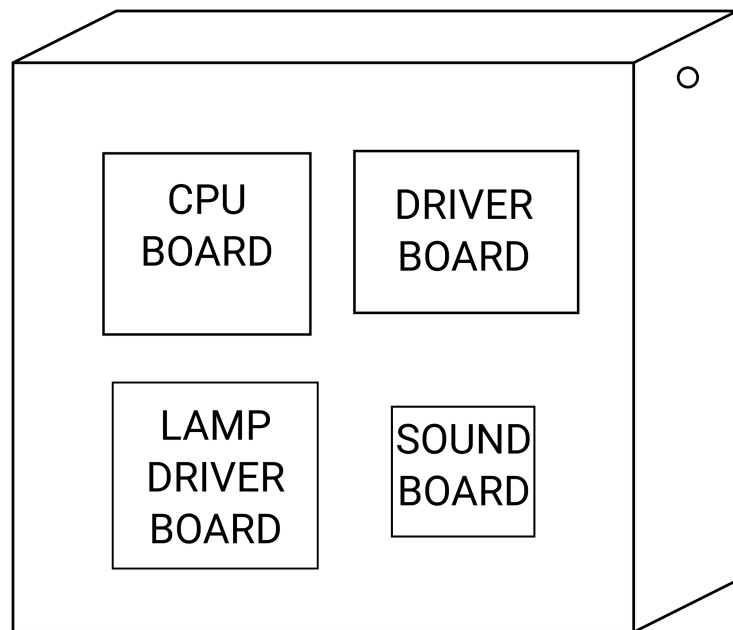
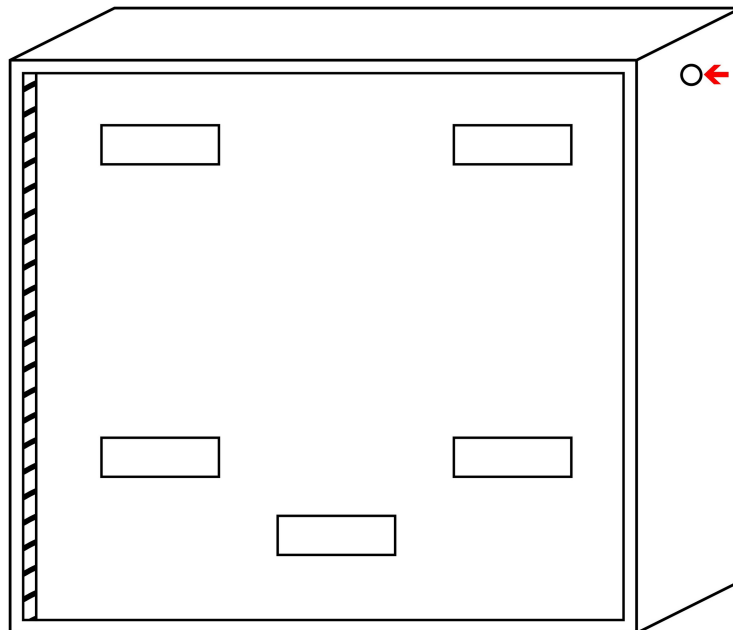
Before the installation of the new board, several points must be checked :

- The pins of the different connectors must be clean and without corrosion (green traces) due to the humidity or the backup battery of the original CPU board. In case of corrosion, replace ALL the damaged pins.
- The power supply board and all the display boards must be in good working condition.
- The voltages provided by the power supply board should be checked using the voltmeter (refer to the Bally/Stern instruction manual for the list of the required measurements).
- The fuses must be properly sized (refer to the Bally/Stern instruction manual for a list of the fuses to be tested and their value).
- Any electronic board must be handled by the edges, any contact with a track or a component can generate damage due to static electricity.

**/!** Any installation performed in a pinball machine in an unknown state or without the previously described checks done may invalidate the warranty.

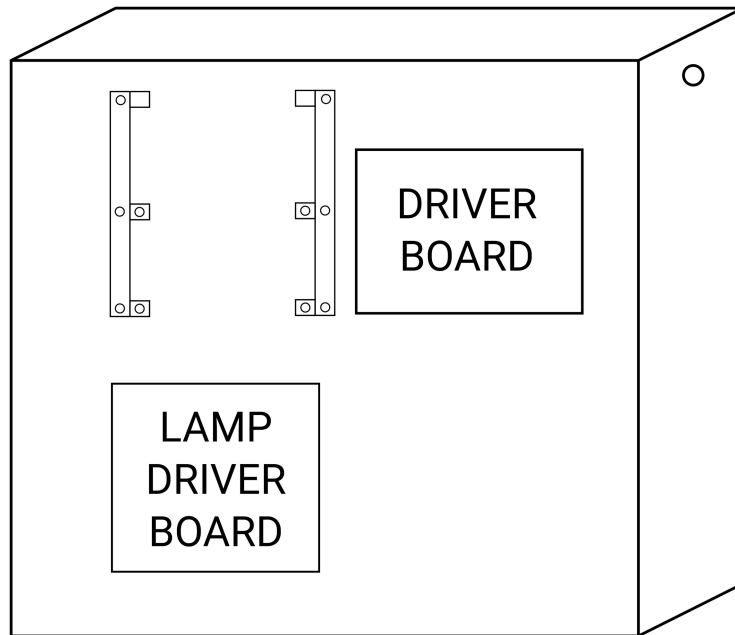
## Step 1

Unlock the backbox with the key. Remove the backglass and open the door to access to the electronic boards.



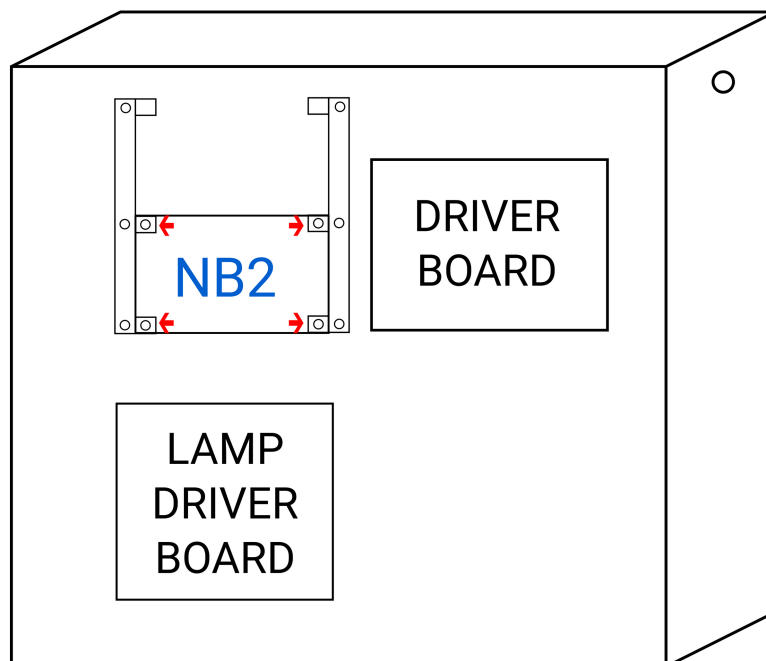
## Step 2

Disconnect all connectors from both the CPU and the sound board. Remove the screws holding these boards. Then remove the boards from the nylon separators.



## Step 3

Unpack the NB2 board from its anti-static package. Mount it using the nylon separators and the screws.

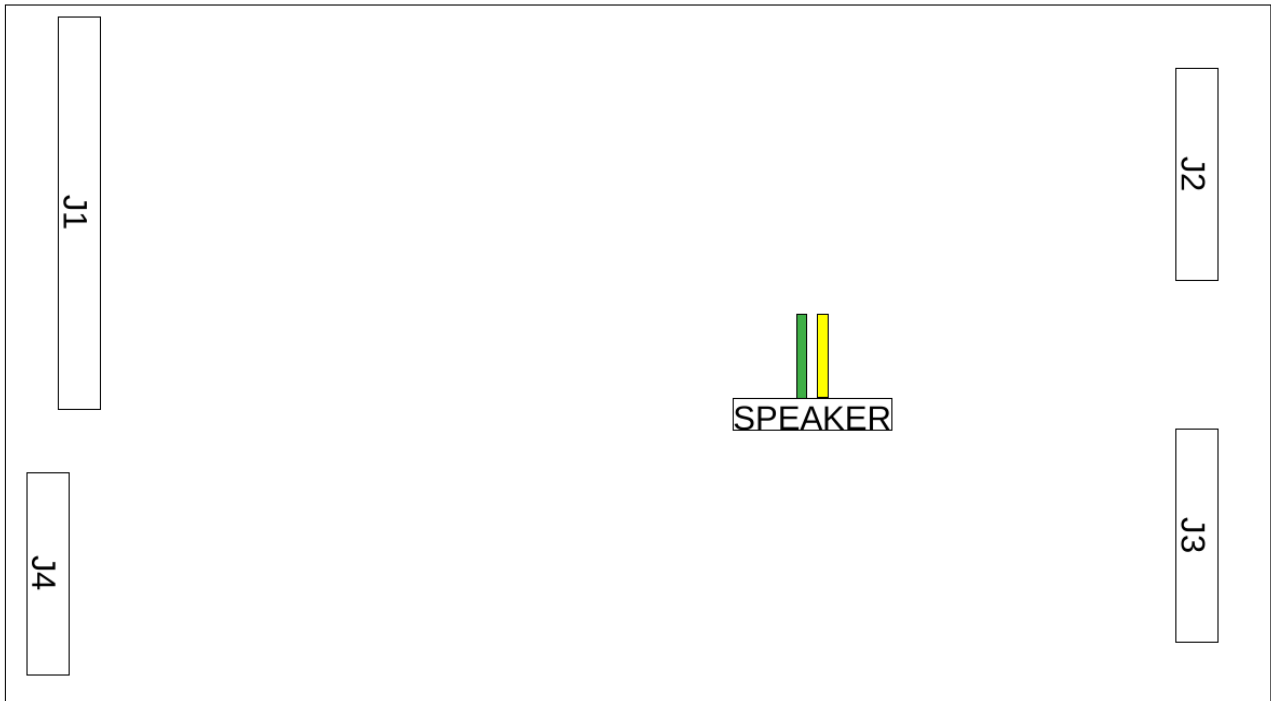




The NB2 should now be well held.

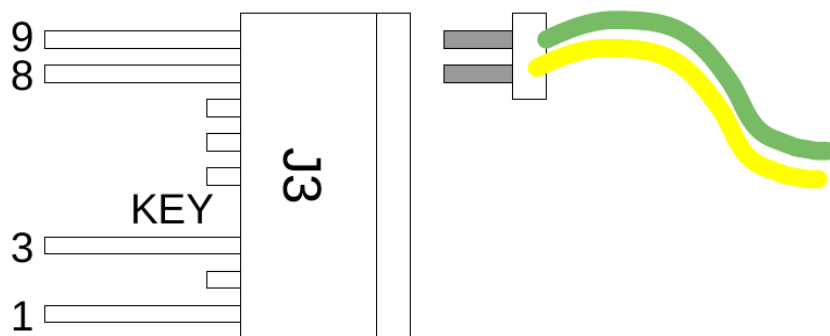
#### Step 4

Connect the connectors to the NB2 board according to the wiring plan below.



For the Bally pinball machines, use the 2 pins extension to connect the speaker output to the 2 pins connector disconnected from the sound board.

For the Stern pinball machines, use the 2 pins extension to connect the speaker output to the **sound board J3 connector** (pins 8 and 9).



**⚠** Check all the connections before proceeding with the installation. Any damage caused by a bad connection will simply cancel the warranty.

## Step 5

Adjust the Game Select DIP Switches according to the game in which the NB2 board is installed.

Switch 1 correspond to the Freeplay mode. Setting the Switch 1 to ON will make the game free to play.

	N° DU JEU	FREEPLAY	GAME SELECT							
			1	2	3	4	5	6	7	8
ALI	80	-	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF
BABY PAC MAN	54	-	OFF	ON	ON	OFF	ON	ON	OFF	
BIG GAME	80	-	ON	OFF	ON	OFF	OFF	OFF	OFF	
BLACK JACK	7	-	OFF	OFF	OFF	OFF	ON	ON	ON	
BLACK PYRAMID	48	-	OFF	ON	ON	OFF	OFF	OFF	OFF	
BMX	47	-	OFF	ON	OFF	ON	ON	ON	ON	
CATACOMB	90	-	ON	OFF	ON	ON	OFF	ON	OFF	
CENTAUR	46	-	OFF	ON	OFF	ON	ON	ON	OFF	
CYBERNAUT	56	-	OFF	ON	ON	ON	OFF	OFF	OFF	
DOLLY PARTON	18	-	OFF	OFF	ON	OFF	OFF	ON	OFF	
DRACULA	74	-	ON	OFF	OFF	ON	OFF	ON	OFF	
DRAGONFIST	92	-	ON	OFF	ON	ON	ON	OFF	OFF	
EIGHT BALL	4	-	OFF	OFF	OFF	OFF	ON	OFF	OFF	
EIGHT BALL DELUXE	33	-	OFF	ON	OFF	OFF	OFF	OFF	ON	
ELEKTRA	38	-	OFF	ON	OFF	OFF	ON	ON	OFF	
EMBRYON	35	-	OFF	ON	OFF	OFF	OFF	ON	ON	
EVEL KNIEVEL	3	-	OFF	OFF	OFF	OFF	OFF	ON	ON	
FATHOM	36	-	OFF	ON	OFF	OFF	ON	OFF	OFF	
FIREBALL CLASSIC	55	-	OFF	ON	ON	OFF	ON	ON	ON	
FIREBALL II	34	-	OFF	ON	OFF	OFF	OFF	ON	OFF	
FLASH GORDON US	32	-	OFF	ON	OFF	OFF	OFF	OFF	OFF	
FLASH GORDON FR	31	-	OFF	OFF	ON	ON	ON	ON	ON	
FLIGHT 2000	84	-	ON	OFF	ON	OFF	ON	OFF	OFF	
FREEDOM	1	-	OFF	OFF	OFF	OFF	OFF	OFF	ON	
FREEFALL	87	-	ON	OFF	ON	OFF	ON	ON	ON	
FRONTIER	28	-	OFF	OFF	ON	ON	ON	OFF	OFF	
FUTURE SPA	19	-	OFF	OFF	ON	OFF	OFF	ON	ON	
GALAXY	79	-	ON	OFF	OFF	ON	ON	ON	ON	
GOLD BALL	52	-	OFF	ON	ON	OFF	ON	OFF	OFF	
GRAND SLAM 2	50	-	OFF	ON	ON	OFF	OFF	ON	OFF	
GRAND SLAM 4	51	-	OFF	ON	ON	OFF	OFF	ON	ON	
HARLEM GLOBETROTTERS	17	-	OFF	OFF	ON	OFF	OFF	OFF	ON	
HOT HAND	76	-	ON	OFF	OFF	ON	ON	OFF	OFF	
HOTDOGGIN	25	-	OFF	OFF	ON	ON	OFF	OFF	ON	
IRON MAIDEN	93	-	ON	OFF	ON	ON	ON	OFF	ON	
KINGS OF STEEL	45	-	OFF	ON	OFF	ON	ON	OFF	ON	
KISS	15	-	OFF	OFF	OFF	ON	ON	ON	ON	
LECTRONAMO	71	-	ON	OFF	OFF	OFF	ON	ON	ON	
LIGHTNING	88	-	ON	OFF	ON	ON	OFF	OFF	OFF	
LOST WORLD	9	-	OFF	OFF	OFF	ON	OFF	OFF	ON	
MAGIC	77	-	ON	OFF	OFF	ON	ON	OFF	ON	
MATA HARI	6	-	OFF	OFF	OFF	OFF	ON	ON	OFF	

	N° DU JEU	FREEPLAY	GAME SELECT							
			1	2	3	4	5	6	7	8
MEDUSA	37	-	OFF	ON	OFF	OFF	ON	OFF	ON	
MEMORY LANE	70	-	ON	OFF	OFF	OFF	ON	ON	OFF	
METEOR	78	-	ON	OFF	OFF	ON	ON	ON	OFF	
MR AND MRS PAC MAN	41	-	OFF	ON	OFF	ON	OFF	OFF	ON	
MYSTIC	24	-	OFF	OFF	ON	ON	OFF	OFF	OFF	
NIGHT RIDER	2	-	OFF	OFF	OFF	OFF	OFF	ON	OFF	
NINE BALL	86	-	ON	OFF	ON	OFF	ON	ON	OFF	
NITRO GROUND SHAKER	20	-	OFF	OFF	ON	OFF	ON	OFF	OFF	
NUGENT	73	-	ON	OFF	OFF	ON	OFF	OFF	ON	
ORBITOR 1	94	-	ON	OFF	ON	ON	ON	ON	OFF	
PARAGON	16	-	OFF	OFF	ON	OFF	OFF	OFF	OFF	
PINBALL	67	-	ON	OFF	OFF	OFF	OFF	ON	ON	
PLAYBOY	11	-	OFF	OFF	OFF	ON	OFF	ON	ON	
POWER PLAY	5	-	OFF	OFF	OFF	OFF	ON	OFF	ON	
QUICKSILVER	83	-	ON	OFF	ON	OFF	OFF	ON	ON	
RAPID FIRE	53	-	OFF	ON	ON	OFF	ON	OFF	ON	
ROLLING STONES	23	-	OFF	OFF	ON	OFF	ON	ON	ON	
SEAWITCH	82	-	ON	OFF	ON	OFF	OFF	ON	OFF	
SILVERBALL MANIA	21	-	OFF	OFF	ON	OFF	ON	OFF	ON	
SKATEBALL	27	-	OFF	OFF	ON	ON	OFF	ON	ON	
SPACE INVADERS	22	-	OFF	OFF	ON	OFF	ON	ON	OFF	
SPEAKEASY 2	43	-	OFF	ON	OFF	ON	OFF	ON	ON	
SPEAKEASY 4	44	-	OFF	ON	OFF	ON	ON	OFF	OFF	
SPECTRUM	40	-	OFF	ON	OFF	ON	OFF	OFF	OFF	
SPLIT SECOND	89	-	ON	OFF	ON	ON	OFF	OFF	ON	
SPY HUNTER	49	-	OFF	ON	ON	OFF	OFF	OFF	ON	
STAR GAZER	85	-	ON	OFF	ON	OFF	ON	OFF	ON	
STAR TREK	14	-	OFF	OFF	OFF	ON	ON	ON	OFF	
STARS	69	-	ON	OFF	OFF	OFF	ON	OFF	ON	
STINGRAY	68	-	ON	OFF	OFF	OFF	ON	OFF	OFF	
STRIKES AND SPARES	8	-	OFF	OFF	OFF	ON	OFF	OFF	OFF	
SUPERSONIC	12	-	OFF	OFF	OFF	ON	ON	OFF	OFF	
THE SIX MILLION DOLLARS M.	10	-	OFF	OFF	OFF	ON	OFF	ON	OFF	
TRIDENT	75	-	ON	OFF	OFF	ON	OFF	ON	ON	
VECTOR	39	-	OFF	ON	OFF	OFF	ON	ON	ON	
VIKING	26	-	OFF	OFF	ON	ON	OFF	ON	OFF	
VIPER	91	-	ON	OFF	ON	ON	OFF	ON	ON	
VOLTAN	13	-	OFF	OFF	OFF	ON	ON	OFF	ON	
WILD FYRE	72	-	ON	OFF	OFF	ON	OFF	OFF	OFF	
XENON FR	29	-	OFF	OFF	ON	ON	ON	OFF	ON	
XENON US	30	-	OFF	OFF	ON	ON	ON	ON	OFF	
XS AND OS	42	-	OFF	ON	OFF	ON	OFF	ON	OFF	

## Getting started

Turn on the game. The two red LEDs should light : +3.3V and +12V. The green LED should blink regularly at a rate of one blink per second. Refer to the “Troubleshooting” section on page 12 and 13 otherwise.

At startup, several information appear on the displays for a few seconds :

- Player 1 display : game number (see page 10 and 11)
- Player 2 display : firmware version
- Player 3 and 4 displays : firmware date

The game number on player 1 display allows to check the expected game has been selected with the Game Select switches..

The game is now operational.

## Adjusting the sound volume

Adjusting the sound volume can be done in two ways :

- Using the potentiometer in the cabinet if the machine is equipped.
- Using the potentiometer on the NB2.

For games equipped with a talking sound board, the volume balance between sound and speech can be adjusted using the game-specific configuration file. See the section about the SD card on page 14 for more details.

## Factory reset

A factory reset allows the card to be restored to its initial state. It erases all user data (scores, parameters, statistics). The data on the SD card is not affected. The factory reset is carried out by positioning the 8 switches of the GAME SELECT switch block to OFF and then powering the pinball machine on. The factory reset is effective from the first flash of the green LED.

## Troubleshooting

A first diagnosis can be done with the three LEDs of the NB2 board.

If the two red LEDs are not lit :

Check that the power supply board, the fuses and the connections are working correctly.

If the game does not start or the green LED does not blink properly :

Several problems are detected by the software, the diagnosis is done by means of the green LED, its non-regular blinking gives an error code.

Example : The green LED blinks 7 times rapidly then stays off for 3 seconds before blinking again 7 times rapidly, etc. This corresponds to the error 7 code.

Error Code	Description	Solution
2	Missing or failing SD card	Replace the SD card
3	Incorrectly formatted SD card or corrupted FAT32 file system	Reformat the SD to FAT32 and copy all NB2 files on it. Files are available on <a href="http://www.pinball-technology.com">www.pinball-technology.com</a>
4	Invalid or corrupted system file	Copy the system file again
5	Invalid system file	Copy the system file again
6	Missing system file	Copy a system file to the system folder
7	Missing or failing Flash memory	Contact your reseller
8	Incompatibility between hardware and firmware	Install a compatible firmware version
9	Wrong selected game	Check the Game Select switches
10	Game load error	Contact your reseller

If the sound does not work :

Check the connection.

Check the impedance of the speaker using a multi-meter : 2 Ohm, 4 Ohm or 8 Ohm.

As a last resort, cut the metal braid linking the speaker and the ground.

If the sound suddenly crackles or makes abnormal noises :

Format the SD card and copy back all files to it.

## The SD card

The SD card supplied is an 8 GB SD card. This is a very common memory format that can be plugged in most computers. To extract the SD card from its holder, pinch the card by the sides and pull down.

The SD card contains all the programs and sound files needed to operate the NB2 board..

All those files can be downloaded on : [www.pinball-technology.com](http://www.pinball-technology.com).

It is not recommended to modify files or folders that are outside the scope of this documentation.

SD content :

- a "01-NB2" folder containing a sub-folder for each game. In these sub-folders are the audio files with the following name format :  
"number\_of\_the\_sound.wav", possibly with a configuration file :  
"game\_name.conf".
- a system folder containing one or more firmware files with the name format :  
"system\_upcpu\_version.bin"
- a "Jukebox" folder containing the jukebox configuration file "jukebox.conf" and audio files.

## Sound customization

Only one type of sound file is supported by the NB2 board : WAV file sampled at 44100 Hz with one of the four following formats : 8bit PCM MONO, 8bit PCM STEREO, 16bit PCM MONO and 16bit PCM STEREO. Others sound file types (MP3, WMA, OGG, ...) are not supported.

To replace an original sound, open the folder of the desired game, locate the sound to be changed, delete it and copy the selected sound into the folder.

Rename this new sound with the name of the deleted sound.

Example : Replace "032-Fireball\_II .wav" sound from Fireball II by a new file "sexy\_voice.wav".

- Open the folder "02-NB2"
- Open the folder "032-Fireball\_II"
- Delete the file "032-Fireball\_II .wav"
- Copy the new audio file "sexy\_voice.wav" in the same folder
- Rename "sexy\_voice.wav" in "032-Fireball\_II .wav"
- Disconnect the SD card properly from the computer and plug it in the socket of the NB2 board.

## Specific configuration files

Some games have a specific configuration file, this is the case for games equipped with a talking sound board. The two parameters contained in this file allow you to adjust the volume balance between sounds and speeches.

<b>Parameter</b>	<b>Value</b>	<b>Meaning</b>
SoundVolume	Volume (0 to 100)	Sound Volume
SpeechVolume	Volume (0 to 100)	Speech volume

## Jukebox mode

The jukebox mode of the NW7 board allows the pinball machine to play music between or during games.

The Jukebox mode is disabled by default.

The Jukebox mode is configurable with the "jukebox.conf" file stored in the "Jukebox" folder of the SD card. The configuration is done by a system of parameters/values.

<b>Parameter</b>	<b>Value</b>	<b>Meaning</b>
Jukebox	ON	Jukebox enabled
	OFF	Jukebox disabled
Random	ON	The jukebox reads the playlist randomly
	OFF	The jukebox read the playlist in order
PlayDuringGame	ON	The jukebox continues to play music after a game is started
	OFF	The jukebox stops to play music after a game is started
PlayDuringAttract	ON	The jukebox continues to play music after a game is over
	OFF	The jukebox stops to play music after a game is over
VolumeDuringGame	Volume (0 to 100)	Jukebox music volume during games

VolumeDuringAttract	Volume (0 to 100)	Jukebox music volume when game is over
StartTime	Seconds	Delay before the jukebox starts to play music
PauseTime	Seconds	Delay between tracks
DisableWithCreditButton	ON	Jukebox is disabled if the credit button is pressed when the pinball machine is turned on
	OFF	Credit button has no effect on the jukebox
Fades	ON	The jukebox decreases its music volume smoothly when it stops
	OFF	The jukebox decreases its music volume brutally when it stops

Configuration example : Enable the jukebox mode and add the audio file "I love pinballs.wav" to the playlist.

- Open the "Jukebox" folder
- Copy the file "I love Pinballs.wav" in the folder
- Edit the "jukebox.conf" file with any text editor
- Replace the line "Jukebox OFF" with "Jukebox ON".
- Save and close the "jukebox.conf" file.
- Disconnect the SD card properly from the computer and plug it in the socket of the NB2 board.

In order to define the order of the music in the jukebox playlist, 10 subfolders stored in the Jukebox folder named "0" to "9" can be used. A sound file stored in the folder "0" will always be the first item in the playlist, a sound file stored in the folder "1" will be the second, and so on.



## Updating the firmware of the NB2 board

The NB2 board has a powerful update system that allows you to get the latest firmware version in just a few steps.

To perform an update, you need a "system\_upcpu\_version\_number.bin" file, then follow the instructions below :

- Open the "system" folder
- Copy the "system\_upcpu\_new\_version.bin" file in this folder, the old version files do not need to be deleted.
- Disconnect the SD card properly from the computer and plug it in the socket of the NB2 board.
- Turn on the pinball machine.
- The update is done automatically and lasts about thirty seconds. During this time, the green LED blinks very fast. Once the operation is complete, the game is operational.